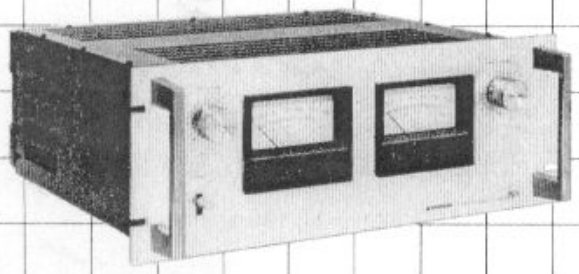
STEREO POWER AMPLIFIER

SPEC-4

OPERATING INSTRUCTIONS

S
S/G



PIONEER

CONTENTS

Features 2
Stereo System Set-up 3
Installation Precautions 3
Connection Diagram 4
Connections 5
Front Panel Facilities 6
Operating Procedure 7
Using the Input Level Controls 7
Additional SPEC-4 Applications 8
Installing in Rack 9
Specifications 10
Characteristic Charts 11
Setting the Line Voltage Selector Switch 12

FEATURES

Dynamic 150+150Watts Power Output, Generous High-power Design

The SPEC-4 employs DC construction which excludes capacitors from the NFB circuits and uses a dual transistor differential amplifier with a current mirror circuit in the 1st stage. This provides a stable operation and also high gain over a wide frequency range. The pre-driver stage is a class A amplifier circuit with a regulated current circuit for the load. This makes for high-gain amplification with superior linearity. Furthermore, there is an overdrive limiter and power limiter circuit which is designed to protect the power transistors and make for added reliability.
The power stage employs a 3-stage Darlington pure complementary parallel SEPP circuit. The SPEC-4 delivers

Continuous Power Output of 150 watts* per channel, min., at 8 ohms from 20 Hertz to 20,000 Hertz with no more than 0.01 % total harmonic distortion.

Completely Independent and Perfectly Stable Left/Right Power Supplies

The mighty power supplies are completely separated for the left and right channels. Also, each channel is provided with two 22,000μF large-capacity electrolytic capacitors and large transistors with a superior regulation. They achieve outstanding channel separation and a clear, powerful reproduced sound, in addition to the wide frequency response. There is a built-in surge killer circuit to suppress inrush currents from the power transformers and high currents which charge the electrolytic capacitors. This circuit ensures that none of the parts are affected by these adverse currents.

Protective Circuits Composed of Fast-response Relays and Electronic Circuits

Each channel is protected by a DC and overcurrent detection relay circuit. In the event of the speaker terminal shorting due to poor connections or when DC current is generated in the output, the output circuit is immediately disengaged and the speakers and transistors are safeguarded against any possible damage. The protective circuits also function as muting circuits when the power switch is turned on and off.

Peak Level Meters with Outstanding Waveform Response

This power amplifier incorporates logarithmic compression peak meters with a wide scale (−40 − +3dB). With 8-ohm speakers, they allow the output to be read out from 0.01W to 300W. Moreover, the meters feature a fast response for peak signal indication. In addition to the peak output reading, it is easy to interpret the dynamic margin with respect to the SPEC-4's clipping level.

Input Level Controls with dB Calibration

The SPEC-4 is equipped with input level controls with direct readout attenuation values (−dB). These can be used to continuously adjust the input levels for each channel in accordance with the rated output voltage of the preamplifier. In this way, the SPEC-4 can perform the proper gain control according to the preamplifier's output level. The preamplifier will thus be used in the condition possible for the best S-N ratio and distortion characteristics.

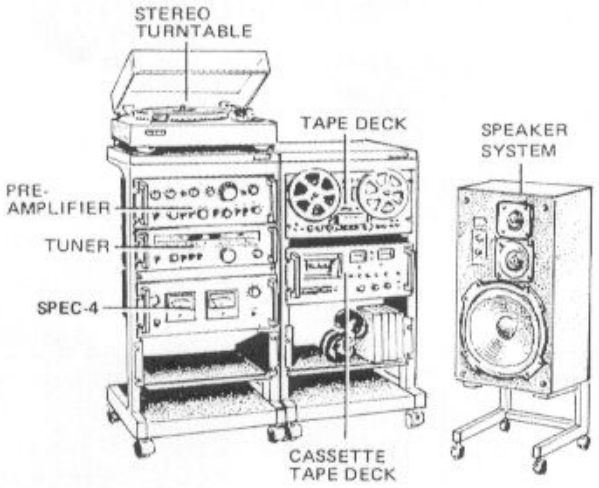
Stylishly Professional Front Panel Design

Just as you would expect from a sophisticated system, the SPEC-4's front panel is professionally designed with the large level meters in the center. Also, the front panel's dimensions allow the model to be mounted in an EIA standard rack, just like real professional-use amplifiers.

** Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifiers.*

STEREO SYSTEM SET-UP

The SPEC-4 is a stereo power amplifier which really satisfies audiophiles who demand only the best in wide frequency response and high output features. Make sure that you choose a preamplifier, speaker system and other components with a correspondingly high level of quality and performance so that the SPEC-4 is given a chance to display its powers to the full. Its front panel dimensions are tailored to EIA standards so that it can be rack-mounted with other components. This makes it easy to operate where space is at a premium.



INSTALLATION AND YOUR LISTENING ROOM

Sound reproduced from a stereo system varies a lot according to the location of the system, as well as to the construction and size of the listening room, and to the positioning of the furniture in the room. This is why the system will sound quite different in different rooms. If the speaker system is set up against a wall, for example, this generally accentuates the bass. Furthermore, if the room has a low ceiling, a hard floor or little depth, and if the speaker system is facing a solid wall, then the sound will lose some of its original clarity. This is why it is always a good idea to cover the floor with a carpet and the wall with a well-pleated curtain. These will help improve the sound. Another method which you can experiment with is to vary the positions of the furniture so that the sound will be irregularly reflected.

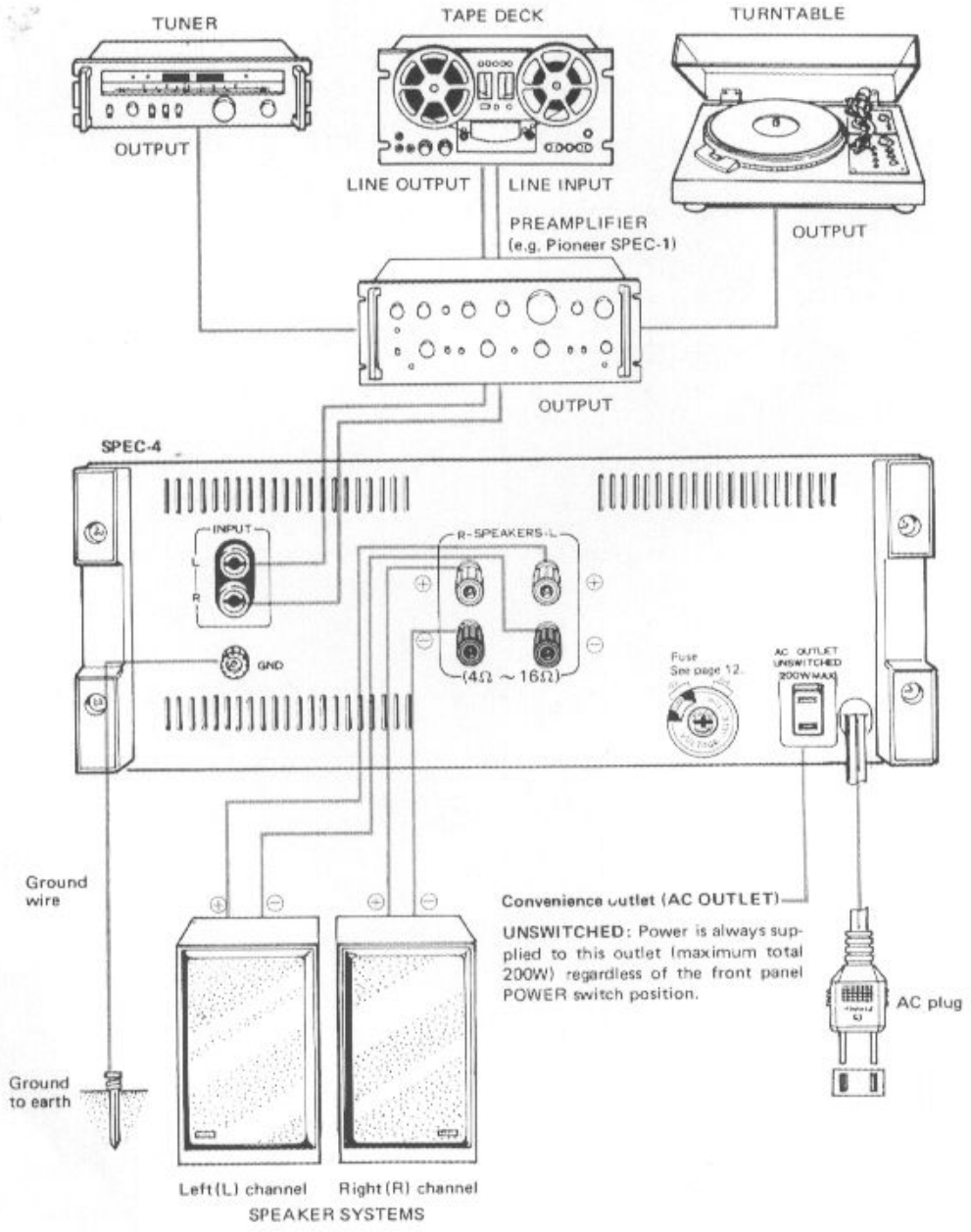
INSTALLATION PRECAUTIONS

Avoid installing the SPEC-4 in the locations mentioned below since they may reduce the service life of your amplifier.

Locations which may cause failures and impair performance	Possible trouble and dangers
1. Locations exposed to direct rays of sun, or close to heaters and other sources of heat; locations which are poorly ventilated	1. External heat will increase the amount of heat generated by the amplifier and impair dissipation; it will also downgrade the performance of the circuit parts. Heat generation may also make the amplifier's operation unstable.
2. Very humid or moist locations	2. These locations are the cause of defective input/output terminal contact and corrosion. Humidity and moisture also cause defective insulation, power leakage and heat generation in the circuit parts.
3. Very dusty or dirty locations	3. Accumulated dirt and dust prevent heat from being dissipated. Also, if accumulated dust is moistened by humidity, it may impair the performance of the insulation.
4. Locations which are unstable or sloping	4. The SPEC-4 is heavy and poses a great danger in an earthquake if not installed in a stable location.
5. Locations with thinner, benzene, insect sprays or inflammable material close-by	5. These substances can corrode the outer panels. Also, the amplifier generates heat and so there is a fire risk if highly inflammable materials are handled in its vicinity.

CONNECTION DIAGRAM

Before making the connections, check that the power is off. Also, make sure that you turn the power off if you want to change over the connections when the components are operating.



CONNECTIONS

PREAMPLIFIER

As shown in Fig. 1, use the accessory connecting cords to connect the stereo preamplifier's output terminals to the SPEC-4's input terminals. The upper jack is for the L (left) channel and the lower jack for the R (right) channel.

SPEAKER SYSTEM

As shown in Fig. 2, connect the right channel speaker (as viewed from listening position) to the R terminals and the left channel speaker to the L terminals. Observe plus (+: red) and minus (−: black) polarities of SPEAKERS terminals and the terminals on rear of speaker systems. Be sure to connect plus to plus and minus to minus.

Connecting the speaker terminals

1. Remove the coating on the speaker cords up to about 15mm from the end (see Fig. 2- 1). Twist the end of the wires so that they are all grouped together and not pointing in different directions.
2. Unscrew the terminal screws, insert the end of the cords into the holes provided in the terminals and tighten the screws up.
3. After tightening the screws, make sure that the wires are properly secured in the terminals.

NOTE:
The high output power of the SPEC-4 requires cords of ample current handling capacity for connection to the speaker systems. Also be sure to make these connections secure. If the cord current capacity is inadequate, or connections loose, overheating or shorting may occur.

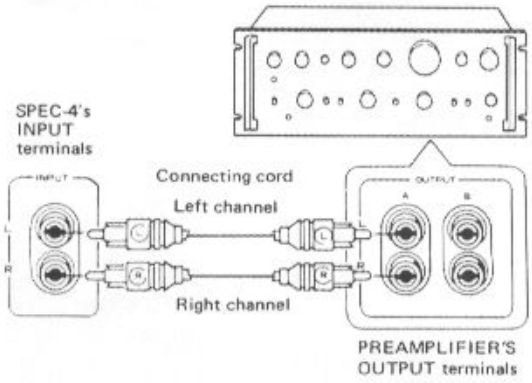


Fig. 1

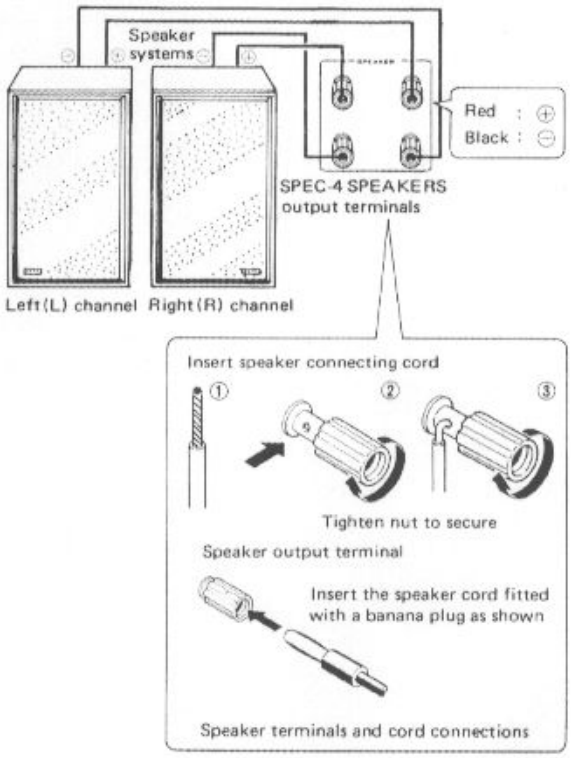


Fig. 2

FRONT PANEL FACILITIES

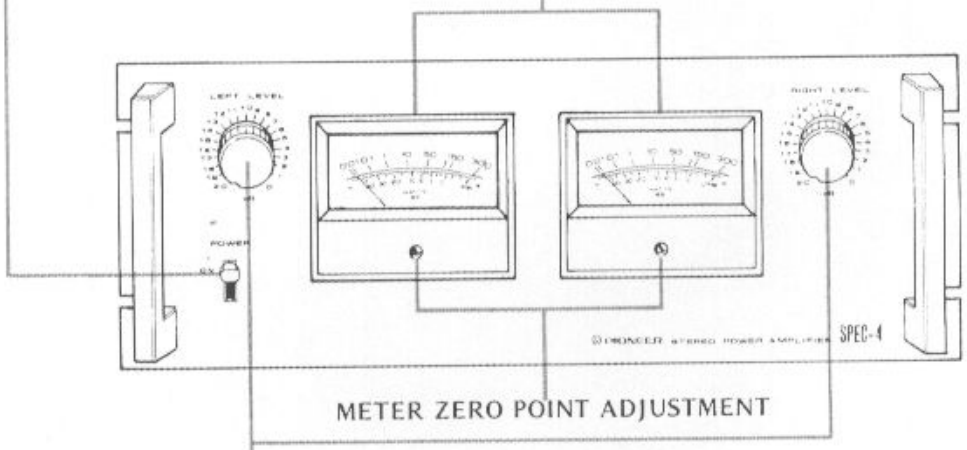
POWER SWITCH

Set to ON position to energize SPEC-4. After setting to ON, there is a brief delay before sound is obtained. This is due to the operation of the muting circuit which prevents noise when the POWER is switched. This function does not indicate difficulty and normal operating condition is attained in a several seconds.

PEAK LEVEL METERS

When speaker systems of 8ohm nominal impedance are connected, these provide direct readout of the peak output power in Watts.

NOTE:
Speaker system impedance varies according to frequency. To obtain a precise measurement of the output power, remove speaker connections and connect 8ohm dummy loads across the SPEAKER terminals.

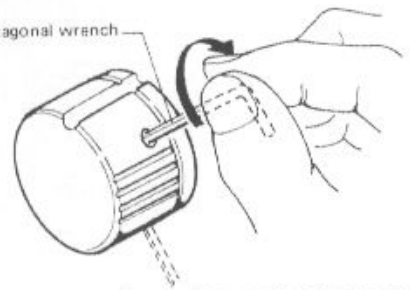


INPUT LEVEL CONTROLS (LEFT & RIGHT)

Adjust the LEFT and RIGHT controls according to the output level (voltage) of the preamplifier connected to the SPEC-4's INPUT (L, R) terminals. If the controls are turned fully to the right (to the "0dB" position), then the rated input will be 1V. Conversely, if they are turned to the left, this will yield an attenuation equal to the graduations, and the rated power output can be varied. Standard input voltages are: 0dB = 1V, −6dB = 2V, −10dB = 3V, −12dB = 4V, and −14dB = 5V.

NOTE:
Turn the controls counterclockwise to the 0dB position if you are using a preamplifier with a maximum output voltage of less than 1V. In such cases, it will not be possible to yield the rated power output listed in the SPEC-4's specifications. (For example, one-quarter of the power output is obtained with a preamplifier having a maximum output of 0.5V.)

ALLEN HEX WRENCH



If any of the control knobs should happen to come loose, tighten by means of the hexagonal wrench.

OPERATING PROCEDURE

1. Setting up the SPEC-4

- Insert the SPEC-4's power plug into the power outlet. If you connected the power plug to the preamplifier's spare power socket (power capacity of over 700W; switch coupled: SWITCHED), you can switch the SPEC-4's power on and off by operating the preamplifier's power switch, as long as you have turned on the SPEC-4's power switch first.
- Check the rated output voltage of the preamplifier and adjust the input level of the SPEC-4 using its input level controls. These controls are normally set to the 0dB positions.

2. Setting up the preamplifier

- Set the preamplifier's power switch to OFF.
- Turn the preamplifier's volume control down low.
- If the model is provided with a tape monitor switch (TAPE MONITOR), set it to the SOURCE (or OFF) position. But set it to ON when playing back a tape.

3. Operation

- Turn the preamplifier's and the SPEC-4's power switch to ON.
- Operate the controls on the preamplifier, turntable, tape deck and tuner. You can now start to listen, or record, as the case may be.
- Adjust the volume and tone using the preamplifier's controls.

USING THE INPUT LEVEL CONTROLS

You can vary the input voltage by using the input level controls (see Table 1). Before you set the input level, however, find out the output/distortion and S/N characteristics of the preamplifier first and then decide on the optimal output voltage.

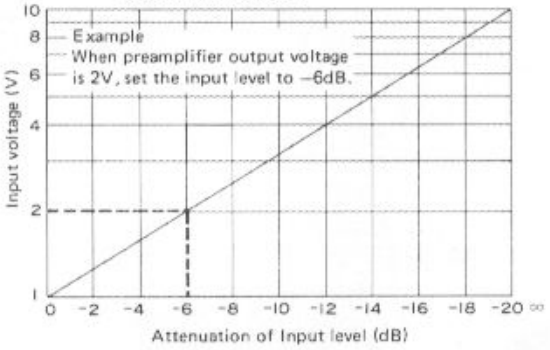
- You can reduce the effective output of the SPEC-4 by keeping the output voltage of the preamplifier at a constant level and attenuating the SPEC-4's input level controls. This action serves to protect the speakers when the speaker system has a relatively low permissible input.
- With a multiple-amplifier system configuration, you can set the volume level of the speakers when you are comparing the features of a number of amplifiers, or when the speakers have different efficiencies (sound pressure levels).

PROTECTIVE CIRCUITRY

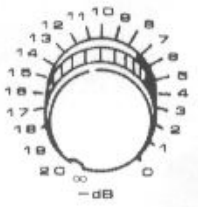
- After you turn the power switch on, there will be no sound from the speakers for about 3 to 8 seconds. This is due to the action of the muting circuit which eliminates the unpleasant noise generated when the power is switched on, and also to the protective circuits in the speakers which protect them when DC current is generated in the output.
- If sound is not delivered properly through the speakers while the components are operating or if you hear a clicking noise caused by the actuation of the built-in relays, the fault may lie with a shorting of the speaker terminals or an overload (when you are using speakers with an impedance of less than 4 ohms). In such cases, the protective circuitry is automatically actuated to safeguard the transistors and speakers against damage. The circuitry will be automatically released once it has dealt with the cause of the fault.

The SPEC-4 delivers a high output power and so its top panel heats up when used for prolonged periods of time. In such cases, make sure that the heat is being dissipated and do not touch the top plate.

Table 1 Input voltage to obtain the rated power output vs. Input level



INPUT LEVEL CONTROL

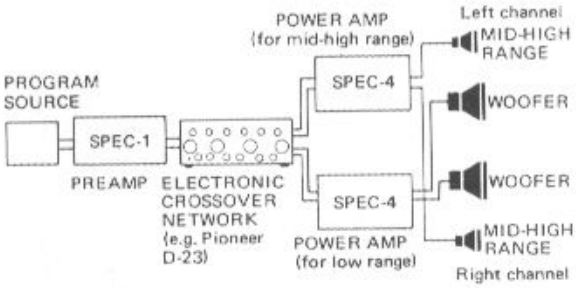


ADDITIONAL SPEC-4 APPLICATIONS

MULTIPLE AMPLIFIER SYSTEM

Fig. 3 shows a configuration based on two stereo power amplifiers which are used to drive a pre-amplifier, crossover network and four special speaker systems, all of which are separate buys.

The main advantage of the multiple amplifier system is that it reduces the intermodulation distortion. It does this by dividing the audible frequency range and amplifying each of the separate frequencies with special stereo amplifiers. The audible frequency range can be split into two or three, in which case the resulting systems are known as 2-way or 3-way multiple amplifier systems.



Two-way multiple amplifier system Fig. 3

Capacitor to protect speakers

If you have mistakenly connected the tweeter and midrange speaker so that the stereo power amplifier is being used for the bass, you may damage the speaker when a strong low-frequency signal is applied. This might happen, for example, when noise is generated because of wrong connections while the components are operating. It is a good idea to use a capacitor to protect the speaker (see Fig. 4) and safeguard against this kind of accident. Table 2 lists the capacitance of the capacitor which is based on the crossover frequency set by the speakers' impedance and crossover network (e.g. Pioneer D-23).

For example, if you are using a speaker with a nominal impedance of 8 ohms, and the crossover frequency is set at 5kHz, the chart shows that the corresponding capacitance of the capacitor is 8μF.

NOTE:
Use a metalized paper (MP), metalized Mylar (MM) or oil capacitor. Do not use an electrolytic capacitor (non-polarized capacitor) since it will impair the quality of the sound.

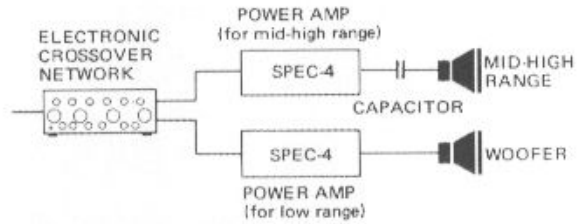


Fig. 4

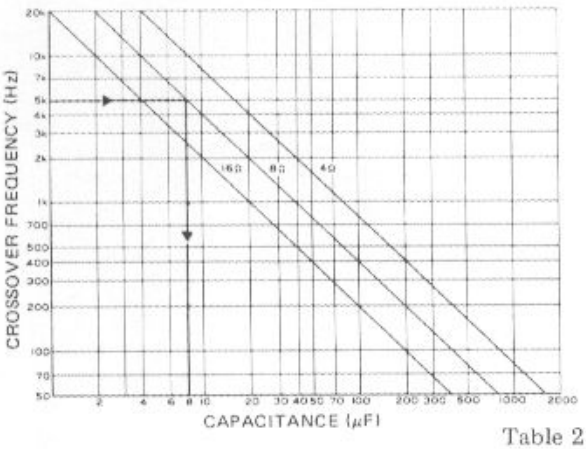


Table 2

INCORPORATION WITH SPEC-1 (PROVIDED WITH SPEAKERS TERMINALS)

The separately sold SPEC-1 preamplifier is designed for incorporation with the SPEC-4 power amplifier. This brings preamplifier functions to the SPEC-4 and provides speaker terminals for two sets of stereo speaker systems. When 2 sets are installed, they can be selected by a SPEAKERS switch. This feature is convenient for selecting speakers according to the program source or comparison listening.

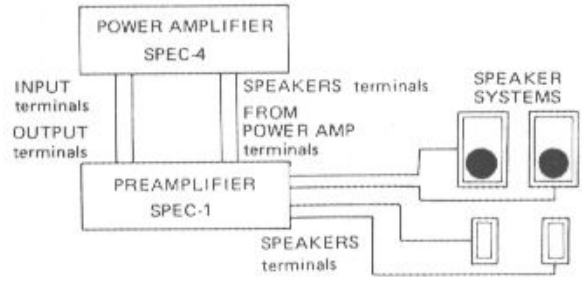


Fig. 5

INSTALLING IN RACK

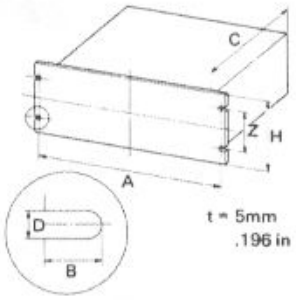
Front panel dimensions of the SPEC-4 (external shape, hole diameters, hole positions) are in accordance with the EIA (Electronic Industries Association) standard on "Racks, Panels and Associated Equipment". Therefore, employ a rack that meets this EIA standard.

RACK MOUNTING

1. Determine rack installation site (see installation precautions on page 3).
2. Install so that rack will not topple when components are mounted. If the installation is permanent, secure the rack to the floor with anchor bolts.
3. When installing two or more power amplifiers, provide more than 10cm (4in.) clear space above each unit, and for improved ventilation, use a forced air cooling fan.
4. Employ a rack depth of at least 10cm (4in.) greater than the largest depth component.
5. Install heavy components (power amplifiers, etc.) in the bottom positions.
6. Mount an EIA standard blank panel or blower panel in the space above the power amplifier.

INSTALLATION STEPS

1. Remove feet (4) from each unit.
2. Install bottom unit first, then proceed to upper units.
3. As shown in Fig. 8, align the front panel holes with those of the rack and secure the unit firmly with screws and washers. If a space occurs between an upper and lower unit, place a supporting object on the lower unit, then secure the upper unit. Afterwards, remove the supporting object.



	mm	in
A:	480	19
B:	15	.578
D:	7	.278
Z:	101.6	4
H:	177	6.97
C:	395	15.55

Fig. 6

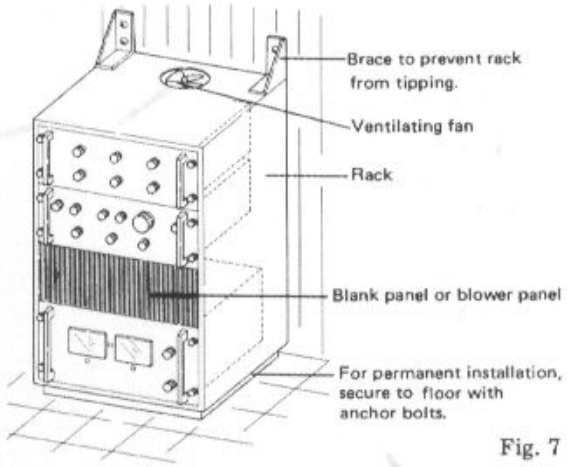

Brace to prevent rack from tipping.
Ventilating fan
Rack
Blank panel or blower panel
For permanent installation, secure to floor with anchor bolts.

Fig. 7

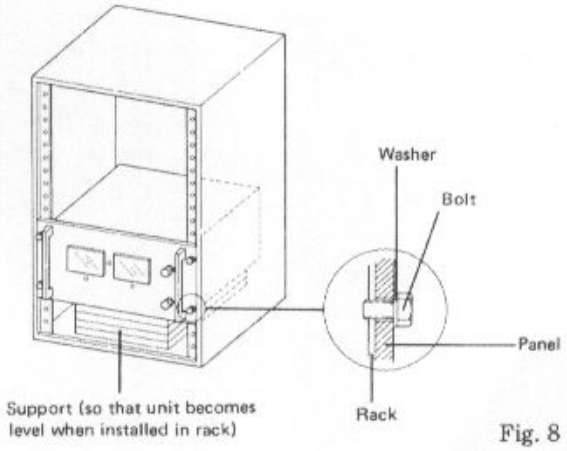


Fig. 8

SPECIFICATIONS

Semiconductors

ICs 2
Transistors 61
Diodes 62

Power Amplifier

Circuitry . . . . . Current mirror loaded differential Amplifier, 3-stage darlington parallel push-pull, direct-coupled OCL. (DC Amplifier construction)

Continuous Power Output of 150 watts* per channel, min., at 8 ohms from 20 Hertz to 20,000 Hertz with no more than 0.01 % total harmonic distortion, or 180 watts*per channel at 4 ohms from 20 Hertz to 20,000 Hertz with no more than 0.03 % total harmonic distortion.

Total Harmonic Distortion (20 Hertz to 20,000 Hertz, 8 ohms)
- Continuous rated power output 0.01%
- 75 watts per channel power output 0.01%
- 1 watt per channel power output 0.01%

Intermodulation Distortion (50 Hertz: 7,000 Hertz=4:1, 8 ohms)
- Continuous rated power output 0.01%
- 75 watts per channel power output 0.005%
- 1 watt per channel power output 0.005%

Frequency Response . . . . . 5 Hertz to 100 kHertz $\pm^{0}_{1}$ dB
Input (Sensitivity/Impedance) . . . . . 1V/50k ohms
Output
- Speaker . . . . . 4 ohms to 16 ohms

Damping Factor (20 Hertz to 20,000 Hertz, 8 ohms) 100
Hum and Noise (IHF, short-circuited, A network) 115dB

Miscellaneous

Power Requirements . . . . . AC 110V, 120V, 220V and 240V (Switchable) 50/60Hz
Power Consumptions . . . . . 760W Max.
Dimensions . . . . . 480(W) x 187(H) x 445(D) mm 18-7/8 x 7-3/8 x 17-7/16 in
Weight: Without Package 24.5kg; 53lb 14oz

Furnished Parts

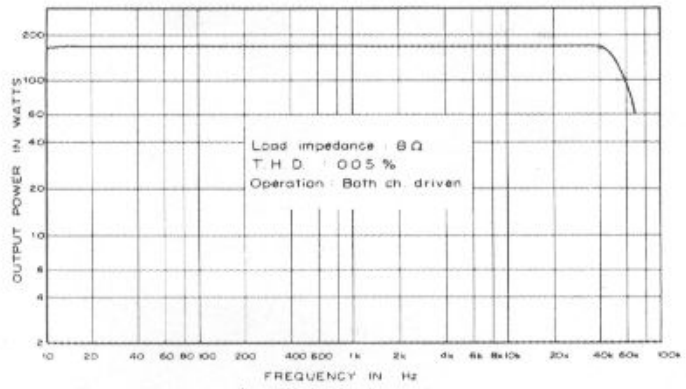
Connection Cord with Pin Plugs 1
Operating Instructions 1

**Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifiers.*

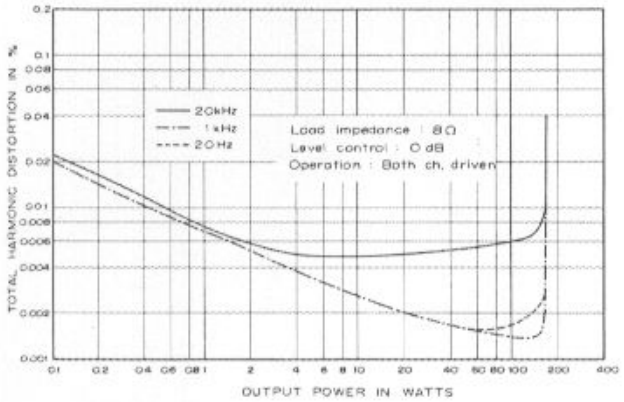
NOTE:
Specifications and the design subject to possible modification without notice due to improvements.

CHARACTERISTIC CHARTS

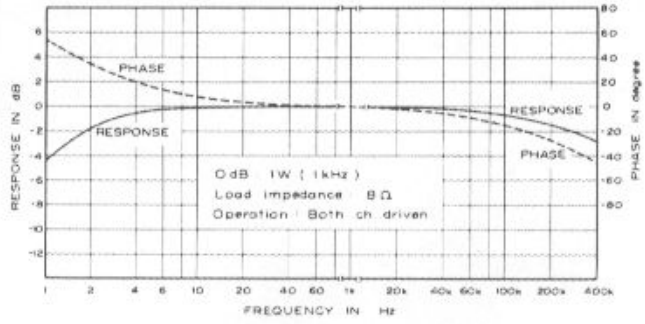
POWER BANDWIDTH



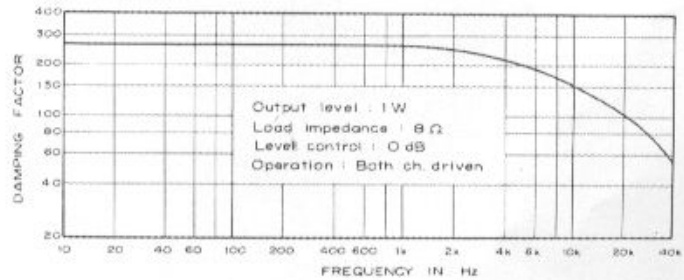
OUTPUT POWER vs. TOTAL HARMONIC DISTORTION



FREQUENCY RESPONSE & PHASE



DAMPING FACTOR



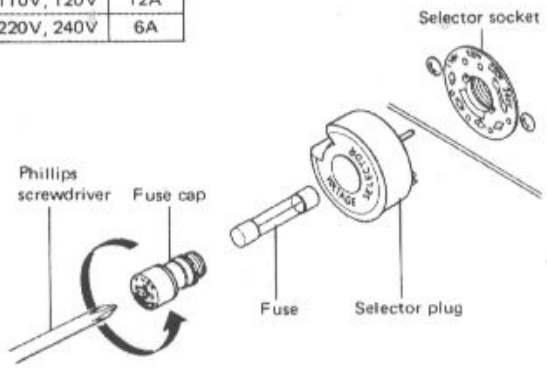
SETTING THE LINE VOLTAGE SELECTOR SWITCH

The SPEC-4 is designed to work on 110/120/220/240V line voltage, and it is provided with a line voltage switch on the rear panel.
Before using your model (i.e. before switching the power on), be sure to check that the line voltage switch is set to the value used in your area. If it isn't, reset the switch, referring to the following procedure.

1. Disconnect the A.C. mains cord.
2. Remove the fuse cap with a Phillips screwdriver.
3. Pull the line voltage selector plug out of its socket.
4. Rotate the plug until the cutaway section is aligned with the correct value and push it back into socket.
5. Refer to table and install replacement fuse (provided as accessory).
6. Replace the fuse cap and secure with the Phillips screwdriver.

Table

VOLTAGE	FUSE
110V, 120V	12A
220V, 240V	6A



How to adjust the line voltage selector switch

PIONEER ELECTRONIC CORPORATION
4-1, Meguro 1-Chome, Meguro-ku, Tokyo 153, Japan
U.S. PIONEER ELECTRONICS CORPORATION
85 Oxford Drive, Moonachie, New Jersey 07074, U.S.A.
PIONEER ELECTRONIC (EUROPE) N.V.
Luithagen-Haven 9, 2030 Antwerp, Belgium
PIONEER ELECTRONICS AUSTRALIA PTY. LTD.
178-184 Boundary Road, Braeside, Victoria 3195, Australia

Printed in Japan
<ARB-236-A>

<77J00Y8B04>